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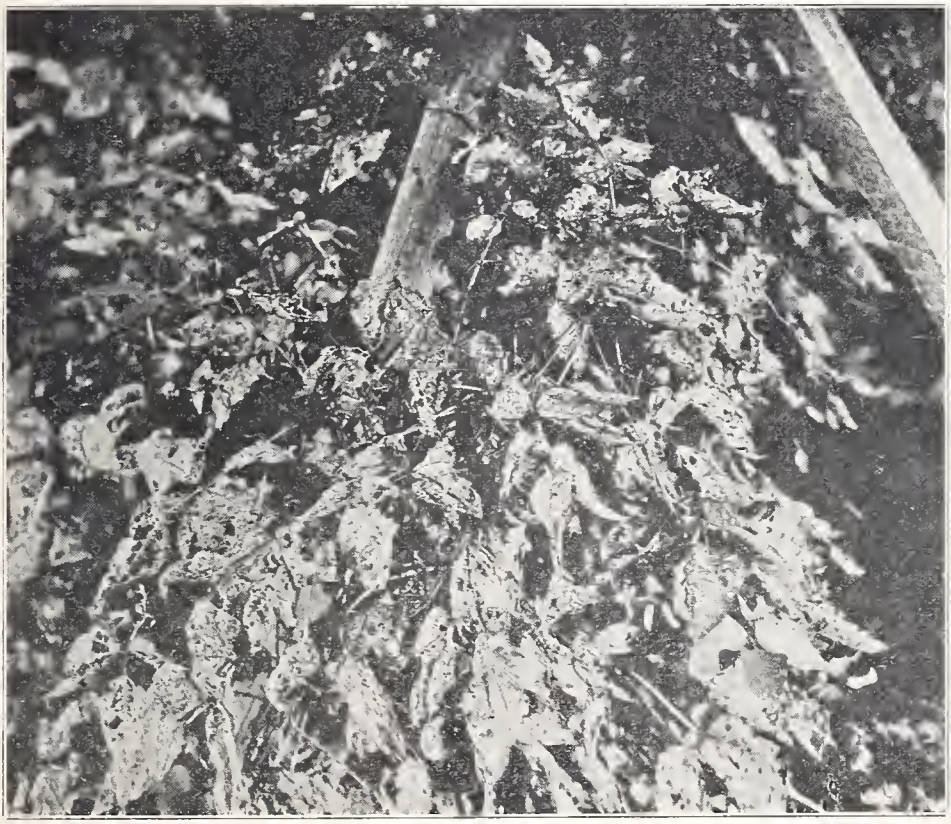

Bean Foliage Destroyed by Mexican Bean Beetle

C. G. Jordan, *Secretary of Agriculture*

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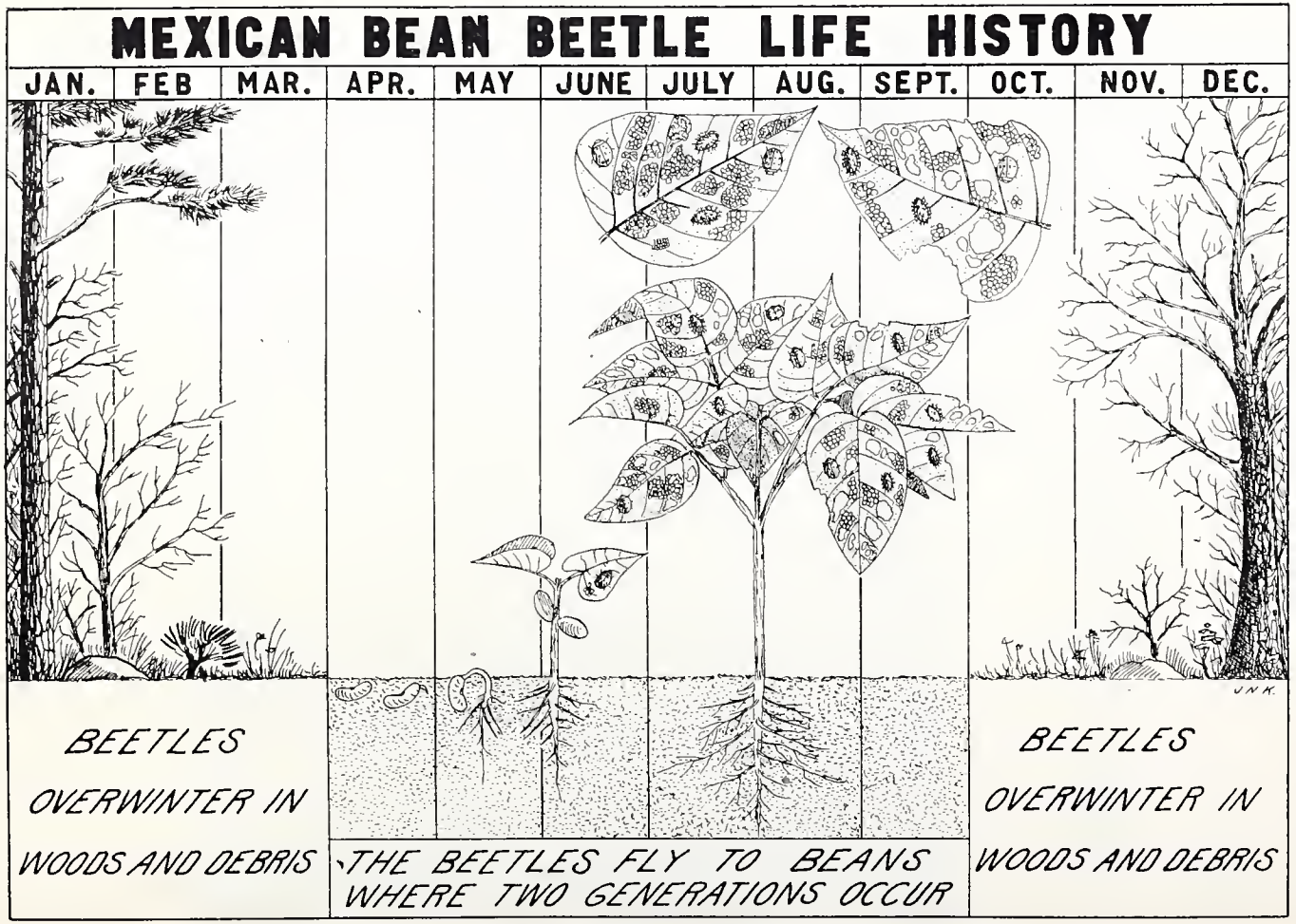

Plate 1. Diagram of Life History of Mexican Bean Beetle.

Mexican Bean Beetle in Pennsylvania

By T. L. Guyton and J. N. Knull*

Bureau of Plant Industry

The Mexican bean beetle (*Epilachna corrupta Muls.*), a primary pest of garden and field beans of various kinds, was found in Pennsylvania for the first time in 1924. Two years later, the insect caused a heavy damage to the garden beans in parts of Greene and Washington Counties. Since this insect is now of some concern to gardeners, the publication of information on its control and behavior is thought advisable. The life history is largely taken from one season's observations at Waynesburg, and the control measures are those developed by United States Department of Agriculture and given trials on bean foliage in both the western and eastern parts of the State.

History and Distribution

The species has been known to occur in the southwestern part of the United States for 75 years, and is supposed to be a native of southern North America. It was discovered in Alabama in 1920, where it was found firmly established near some mining towns. It is thought to have been brought in on shipments of alfalfa hay from the west during the war period.

Since 1920 the beetle has spread rapidly northward and eastward. It probably entered Pennsylvania through West Virginia and Ohio, and is thought to spread about twenty miles each year.

The bean beetle is now found over much of the southern half of the State, and as stated, in 1926 did considerable damage to garden beans in Greene and Washington Counties; and in certain outlying districts in other Counties. Bean plantings often contained areas which were destroyed by the insects, indicating that the infestation was recent, the insect not having had time to establish itself over all parts of the field.

Damage Done in Other States

When first found in Alabama, the insect was destroying all the garden beans in an area near Birmingham. In 1921 the bean crop was destroyed over a larger area, complete defoliation usually occurring in a few weeks following the attack.

In Colorado it is stated that it is not uncommon to see garden and field beans in the infested area a complete failure on account of the injuries of the beetle, and very few farmers attempt to grow beans commercially.

In South Carolina crops of early beans are frequently completely de-

* Photographs by H. B. Kirk.

stroyed, and in North Carolina bush beans planted early in the season produced small crops, while all late varieties are completely destroyed. In West Virginia considerable damage is caused by the beetle in many localities. The beetle has been known in Ohio for a longer period

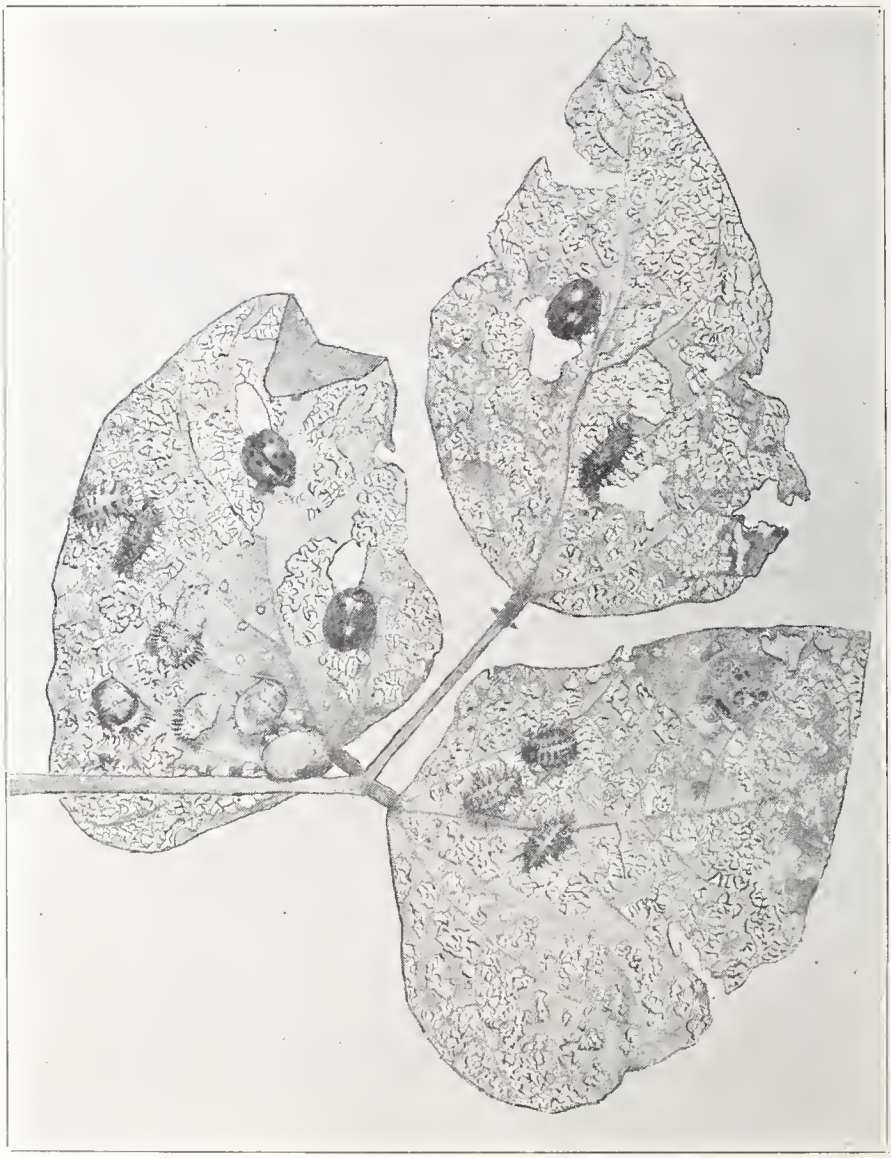

Fig. I. Beetle and Larvae Feeding on Bean Foliage.

than in Pennsylvania. There, authorities say, the beetle is increasing in number and is causing a very considerable loss to bean growers in the southeastern counties of that State.

Extent and Type of Injury

Both the beetles and the larvae feed on the foliage of bean and related plants (see Fig. I). The larvae feed on the lower sides of the leaves

almost exclusively and produce a characteristic chain-like pattern on the leaf. Only the lower layers of the leaf are removed by the larvae feeding. The beetle may feed on either surface, although for the most part its feeding is on the under surface, too. The adult feeding will cause

Fig. II. Mexican Bean Beetles Feeding on Bean Pods.

irregular areas to drop out of the leaf. After the leaves have been fed upon, they soon dry and fall from the plants. It is only a matter of hours for few insects to completely destroy a leaf (see cover page). In severe cases of infestation the pods may serve as food (see Fig. II).

As has been stated, garden beans seem to be the chief food plant of the bean beetle in Pennsylvania. It is known, however, to feed on a number of related plants, such as cowpeas, soy beans and alfalfa.

Life History

In the south there are three generations each year. Farther north the number of generations is less. In North Carolina there are two full generations and a part of a third.

In Greene County, Pennsylvania, in 1926,* there were two generations (see Plate I). The overwintering beetles appeared on the beans

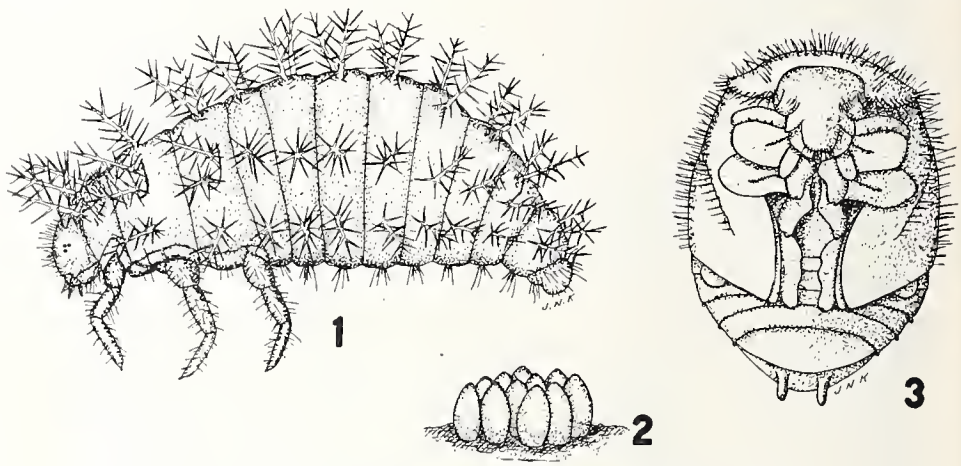

Fig. III. Life Stages of the Mexican Bean Beetle.
1. Larva. 2. Eggs. 3. Pupa.

soon after the first leaves were formed. Eggs were laid by these beetles on the under side of the bean foliage. The larvae hatching from these eggs became mature the first part of July and the second lot of beetles began to appear about the first of August. Egg laying continued through August and the larvae from these eggs reached their full growth about the middle of September, although larvae were found up to freezing weather. The adults of this generation sought hibernating quarters in such places as under leaves and plant remnants in the gardens, in wood and stone piles, in fence corners and in neighboring woodland. Hibernation was completed with the coming of cold weather.

Description of Life Stages

The eggs (see Fig. III, 2) are elliptical in shape, pale orange in color, and are laid in groups on the under sides of the leaves. Each egg is about one-sixteenth of an inch in length.

The larvae (see Fig. III, 1) are greenish in color when small, but

* From notes made by M. R. Osburn.

when fully mature they become dark yellow in color. They are armed with rows of branched spines over the upper surface of the body.

The pupae (see Fig. III, 3) are light yellow in color, about one-quarter of an inch in length; and usually hang from the under sides of the leaves, with head ends down. They are somewhat protected by the discarded larval skins.

The adults (see Fig. IV, 1) are yellow in color at first, but soon turn

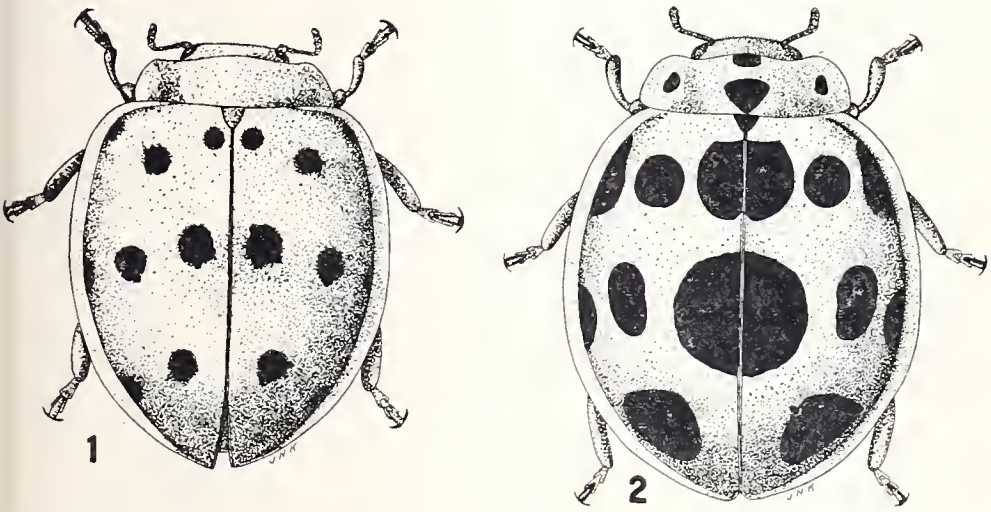

Fig. IV.

1. Adult of Mexican Bean Beetle.
2. Adult of Squash Lady Beetle.

to a light brown. They are stout, convex, and are about one-quarter of an inch in length. Each wing is usually marked with eight small black spots. These spots are not constant in all specimens. The adult is often confused with the closely related squash lady beetle (*Epilachna borealis* Fab.) (see Fig. IV, 2). As indicated by the name, the squash lady beetle feeds on the leaves of squash and related plants. It can easily be separated from the Mexican bean beetle by the arrangement and size of the dark spots on the back of the beetle, the markings on the squash lady beetle being much larger and less numerous than those of the Mexican bean beetle.

Insecticide Trials on Bean Foliage

In contemplation of the control of the Mexican bean beetle, the Bureau of Plant Industry, Pennsylvania Department of Agriculture, made the following tests on stringless green pod bean foliage during the growing seasons of 1925 and 1926. The experiments were run near Har-

risburg, which up to the fall of 1926 was outside the known area of infestation, hence no rates of control could be determined. All applications were very thorough, being directed toward both sides of the leaves, and were applied under the same conditions of temperature and moisture.

The following dusts and sprays gave no burning on bean foliage:

Magnesium arsenate as a dust:
- Magnesium arsenate ..... 1 pound
- Hydrated lime ..... 5 pounds

Calcium arsenate as a dust:
- Calcium arsenate ..... 1 pound
- Hydrated lime ..... 9 pounds

Calcium arsenate-sulfur dust:
- Calcium arsenate ..... 1 pound
- Dusting sulfur (200 mesh) ..... 1 pound
- Hydrated lime ..... 4 pounds

Magnesium arsenate as a spray:
- Magnesium arsenate ..... 2 pounds
- Water ..... 100 gallons

Calcium arsenate as a spray:
- Calcium arsenate ..... 1½ pounds
- Hydrated lime ..... 3 pounds
- Water ..... 100 gallons

Arsenate of lead was also used as sprays and dusts with slight burning in some cases. However, other workers have experienced quite a lot of burning with arsenate of lead, and it is not recommended for use on bean foliage.

Paris green in both dusts and sprays gave heavy burning and is not advised. The fluosilicates gave some burning and until further work has been done we are not recommending their general use; however, some workers farther south are recommending the use of the sodium fluosilicate, one part in nine parts of hydrated lime to be used in the form of a dust.

Control Recommendations

The following control measures are recommended for the Mexican bean beetle. A poison spray or dust is to be used.

For sprays use magnesium arsenate, two pounds to 100 gallons of water; or calcium arsenate, one and one-half pounds and three pounds of lime to 100 gallons of water.

For dusts use:

Magnesium arsenate ....1 pound
Hydrated lime .....5 pounds

or

Calcium arsenate .....1 pound
Hydrated lime .....9 pounds

These recommendations were tried on bean foliages outlined in a preceding paragraph; the number of applications made were such as to have given complete protection throughout the season, and the four formulae were found to be quite safe to use on bean foliage.

Any magnesium arsenate used for dust or spray mixtures should not contain more than five-tenths of one per cent of water soluble arsenic pentoxide. Any calcium arsenate so used should not contain more than two-tenths of one per cent of water soluble pentoxide.

Direct all sprays and dusts toward the under side of the bean foliage.

Due to impurities, hydrated lime will often precipitate in some kinds of water. When this occurs, the value of the lime as a neutralizer is lost and burning may occur.

Mixing Dusts

Dust mixtures are quickly mixed by placing a small coil of one inch mesh chicken wire in a lard can or a can with a tight lid and rolling it over the floor. The can should be rolled sufficiently to allow the dust to become completely mixed. Where larger amounts of dust are required, a churn or barrel should be used for mixing.

Time to Spray or Dust

In infested areas the young bean plants should be sprayed or dusted as soon as the first leaves are unfolded. The application should be repeated at intervals of ten days to two weeks, keeping the foliage well covered until the pest is brought under control.

Green beans intended for food, gathered from sprayed or dusted plants, should be washed sufficiently to remove all spray residue; usually two thorough rinsings in clear water should be enough.

Much can be done in the control by cleaning the fields of crop remnants. These should be plowed under as soon as the beans are harvested. Waste places near fields should be burned over to destroy hibernating beetles.